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# The EXTENSION ENTOMOLOGIST

The problems of the entomologist are unlike those of most other agricultural workers. The extension entomologist's plans and projects are based on the subject of insects affecting agriculture, but he is constantly besieged with inquiries from city dwellers who want information on insects affecting flowers, shrubs, trees, household and stored products, or a small vegetable garden; also insects attacking man and his animal pets. These people are citizens and cannot be ignored. The question is, how can we serve them without giving too much personal service?

The act which makes the Extension Service possible provides that extension work shall consist of the giving of instruction and practical demonstrations in agriculture and home economics to persons not attending, or residents in land-grant colleges and imparting to such persons information on subjects through field demonstrations, publications, and otherwise. Since city people cannot be reached through field demonstrations, they should be reached through teaching material such as press articles and popular bulletins and circulars, or, so far as practicable, through groups such as schools or civic clubs, with individual personal service being kept to the minimum.

*M. P. Jones*

M. P. Jones  
Extension Entomologist

UNITED STATES DEPARTMENT OF AGRICULTURE  
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE AND  
EXTENSION SERVICE, COOPERATING



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PERSONNEL CHANGES

Texas. Mr. Cameron Siddall was appointed assistant extension entomologist to work on cotton insects and their control, effective January 1, 1939. Mr. Siddall is a native of Texas, obtained his B. S. and M. S. degrees in entomology from Texas A. & M. College, and served as county agricultural agent from 1933 to 1935. His experience as an entomologist includes service with the Texas Agricultural Experiment Station in cotton insect research, and with the U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine, in screwworm control work. He was connected with a commercial chemical company in Freeport, Tex., at the time of his appointment.

ANNOUNCEMENT OF MEETING

1939

June 28 to 30. Pacific Slope Branch - Stanford University, Palo Alto, Calif.

ARTICLES

RESUME OF JAPANESE BEETLE RETARDATION WORK IN MARYLAND  
FOR 1938

George Langford, University of Maryland

During the past year a State-wide cooperative Japanese beetle retardation program was conducted in Maryland for the purpose of retarding and delaying the spread of the Japanese beetle in lightly infested areas, and to introduce and demonstrate control work in the heavily infested areas.

As a background for the retardation and control activities, educational work regarding the Japanese beetle and the fundamentals involved in its control was done in all sections of the State. Splendid cooperation was obtained in the educational work from extension people, 4-H Club boys and girls, vocational agricultural teachers, grade and high-school teachers and students, the Farm Bureau, the Grange, garden clubs, women's clubs, and civic organizations throughout the State. Practically every newspaper in the State, both county and metropolitan, printed 1 to 10 or more stories on the Japanese beetle.

Following are statistics of a portion of the educational work by the Department of Entomology:

Lectures and exhibits -	159	Exhibits (fairs and shows)	15
Demonstrations - - - -	118	Circulars distributed	80,000



### Retardation Work

In all the infested areas where practical, the following control activities were undertaken:

- |                   |                              |
|-------------------|------------------------------|
| 1. Trapping       | 4. Colonization of parasites |
| 2. Spraying       | 5. Agricultural adjustment   |
| 3. Soil treatment |                              |

### Results of the Program

Finances. The retardation program against the Japanese beetle was conducted on a thorough-going cooperative basis between the Federal, State, county, and municipal governments and individuals. The Federal Government contributed money and services in the amount of \$33,017.31; the State, \$40,000; 21 counties, \$18,134.79; towns and cities, \$2,373.06; individuals and public agencies, \$2,374.00; a total of \$95,899.16.

Trapping. Approximately 40,000 traps were operated in the State during the year. These traps caught 615.85 barrels of beetles. Traps were operated in 89 cities, towns, and villages. Demonstrational trapping was also done in five heavily infested areas on farms in six counties. The most significant accomplishment in trapping research work this year is the assembly of a trap that can be manufactured complete, with rod, for around 40 cents, as compared with \$1 for the present trap.

Spraying. Spraying demonstrations were conducted throughout the State. The relative efficiency of the several sprays tested are in the order given, as follows:

1. D-X and arsenate of lead
2. McCormick's Japanese beetle spray
3. Acid lead arsenate and wheat flour
4. Nicotine tannate
5. Colloidal lead arsenate
6. Derris and rosin residue
7. Aluminum sulphate and lime

Dusting. A 6-acre dusting demonstration was made in the sweet-corn district of Harford County to determine the efficiency of dust in protecting sweet corn. Hydrated lime dust was effective in reducing the beetle infestation on soybeans.

Soil treatment. Educational work on soil treatment was done throughout the State. Twenty-three actual demonstrations were made. Research work on soil treatment showed that colloidal arsenate of lead, used at the manufacturer's recommendation was ineffective for killing grubs in the soil. Acid lead arsenate was effective at recommended strength.

Colonization of parasites. Parasites are the natural enemies of the Japanese beetle and should afford an ideal way of combating them. Cooper-



ating with the Bureau of Entomology and Plant Quarantine, 364 colonies of parasites were liberated.

Agricultural adjustment. There are crops that many farmers cannot grow economically under beetle conditions. It may be economical to replace them by some other crop that is not severely attacked. Cooperating with the Agronomy Department, tests were made with corn this year to determine the varieties of corn to use and dates for planting under conditions of heavy Japanese beetle infestation. Ten varieties and two planting dates, May 13 and 31, were used. When the corn was planted on May 13, no variety escaped excessive damage. 47.4 percent to 78.6 percent of the ears showed damage, and the bushel loss per acre varied from 9.3 bu., to 23.9 bu., but when planted on May 31, 4 out of 10 varieties had less than 10 percent damage, and the bushel loss per acre varied from only 1.2 bu., to 14.7 bu.

### Public Response and Opinion

Cooperation. The people in all the counties, with the exception of Garrett, were asked to support the program. Garrett County was not asked to cooperate because beetles were not known to exist in that county. The county commissioners in all the other counties, with the exception of one, cooperated. Aside from the cooperation on the part of the county commissioners, the officials in many of the cities and towns, as well as business organizations and private individuals, aided with the program.

Public opinion. In an endeavor to determine public reaction, in general, a questionnaire was submitted to all individual farmers cooperating in the program and to a representative cross-section of residents in the heavily infested cities and towns. The following is a summary of the compiled information.

A. Do you like the Japanese-beetle-trapping idea?

Yes. 94.7 percent      No. 2.7 percent      Noncommittal. 2.8 percent

B. Do you think traps are effective in catching beetles?

Yes. 92.6 percent      No. 3.6 percent      Noncommittal. 3.6 percent

C. Were you satisfied with the program and do you think it should be continued?

Yes. 95.1 percent      No. 2.4 percent      Noncommittal. 2.4 percent

### KEEPING A HOP AHEAD OF THE 'HOPPERS

(Extension Service Review, August 1938)

"Kill the 'hoppers before they hatch" is the slogan of the Adams County, Colo., extension office where grasshopper-control work is a year-round activity. Cultural practices such as disking; harrowing; and plowing roadsides, fence rows, and irrigation ditches are recommended in the fall to destroy egg pods before the ground freezes.



A year-round grasshopper campaign is carried on in the county by the agricultural agent and the home demonstration agent, Grace D. Blomstrom, so that the importance of killing the 'hoppers is continually emphasized. Both carry a grasshopper exhibit in their cars to have it ready for any occasion. In addition to destroying egg beds in the fall, farmers are urged to poison 'hoppers in the spring and summer, but that is only a part of the program.

During the winter months an exhibit of grasshopper egg pods and mounted grasshoppers, with names of each, is shown at local seed shows, grange meetings, and all extension meetings on agricultural and home-economics subjects. At each meeting emphasis is placed on the value of cultural practices to control 'hoppers. The names of several farmers who have had success with this plan are mentioned also. Examples are: Paul Gremel, Brighton, by thorough cultural practices, controlled his 'hoppers last year to such an extent that he did not purchase any poison bait. David Keller, Broomfield, harrowed his ditch banks, disked roadsides and fence rows, and plowed early--result: He seeded and raised an excellent stand of alfalfa in a community where many others failed, and he did not purchase bait until late in the summer.

Forty-four individual exhibits of 'hopper egg pods were prepared and mailed, with a letter of instructions, to the larger schools in the county. Schools that did not receive exhibits were called on personally by one of the extension agents. The supply of egg pods was furnished by older 4-H Club members and the Brighton Chapter of Future Farmers. Reports from superintendents and teachers show that all the children were very much interested in seeing and knowing what 'hopper eggs looked like. Many started at once to see if they had any at home. Plans for an exhibit of both 'hoppers and eggs for each school are being considered for next year.

A series of illustrated circular letters, postal cards, and local news stories was used throughout the year to emphasize the importance of cultural practice. Film strips were also shown when sufficient time could be arranged for in the meetings.

#### ANNUAL REPORT EXCERPTS

##### CONTROL OF HOUSEHOLD INSECTS

The program in this particular, which, in 1936, was limited to New Castle County and a portion of Kent, was expanded to include other Kent County communities and Sussex County as well. No special work of this nature was carried on in New Castle County.

Home demonstration club meetings. Information on the control of household insects was presented at 11 home demonstration club meetings in Kent County with a total attendance of 273 women. The common household insect pests in Delaware were discussed, mounted specimens were displayed, and control out-



lines were distributed. A similar program was conducted at a joint meeting of the Sussex County home demonstration clubs with approximately 200 women present.

Individual contacts and correspondence. As a result of the work with the home demonstration clubs during the past 2 years many people, aside from the members themselves, are now looking to the extension specialists in entomology as the logical source of information on insect control. There has been a tremendous increase in requests for aid. Some of these could be handled by mail but many, on the contrary, necessitated personal visits and a study of conditions for satisfactory results. Ants and termites have occasioned more complaints than any other pests in this field.

Results. This project in every respect has been very much worth-while. Its reception has been excellent, keen interest being shown and appreciation expressed wherever talks have been given; the measures recommended have been generally adopted and good results obtained; and satisfaction in this particular has been responsible for increased service in other phases of insect control.

--- Delaware Entomology Annual Report,  
1937.

#### HOUSEHOLD AND SANITATION INSECTS

This phase has been continued through the cooperation of the Home Economics Department of the Extension Division. The entomologist worked in 10 home demonstration counties, and gave information to all other counties in the State on the control of household insects. The leaders trained in these 10 counties taught lessons to the women of the farm bureau women's units. These women leaders were enthusiastic in their teachings.

Insect-control demonstrations demanded of women leaders. It was reported by county agents that many of the units allowed the nature study phase 10 minutes on the program; that 10 minutes was extended to include the entire afternoon. In short, the women attending the unit meetings wanted the information that the nature-study leaders were bringing to them, and they got it. These nature-study leaders were taught how to demonstrate the life and habits of insects that attacked clothing, stored products in the kitchen, and the vegetables in the garden. The insecticide-mixing demonstration was the most popular of all, and from the reports of the county agents, the most valuable part of the nature study. The farm women wanted to know how to mix and apply the bug poisons, and insisted that the leaders continue when they got started.

Several counties reported that the farm bureau purchased small amounts of materials, such as arsenate of lead, Blackleaf 40, pyrethrum, and hydrated lime for the women leaders. Where the farm bureau did not get the supplies, the farm women purchased the materials themselves. It is not difficult to know why 21,898 Kansas women in 555 communities practiced control of insects in their homes and gardens.

--- Kansas Entomology Annual Report, 1937.



### SPRAYING DEMONSTRATION

Much of the spraying done by some fruit growers is relatively ineffective or inadequate in preventing insect and disease injury owing to lack of skill and thoroughness in application. Several spraying demonstrations were conducted in 1937 for the purpose of illustrating to the grower the importance of thorough application of spray materials. By arrangement with the county agents, growers with orchards of mature trees of uniform size were selected as cooperators. It was made certain that each grower had a modern spray rig and that it was in good working condition. Three or more fruit growers who were known to be highly successful in controlling insects and diseases were selected to do the spraying. A committee of growers was selected to see that the spray thoroughly covered the trees. On the day of the meeting the extension specialist brought along a special high-pressure water meter which was hooked on between the spray rig and the spray hose. Cards were distributed to the growers on which they were to write their estimate of the number of gallons of material necessary to cover the trees adequately. A mixture of lime sulfur and iron sulfate was used so that a jet-black spray was obtained which served as an ideal marker for the spray when it hit the trees. At a given signal, one of the selected growers began to spray, and the number of gallons and fraction of gallons he used was recorded by the extension specialist who manipulated the water meter. The committee saw that each man thoroughly covered his trees, and as soon as they felt the job was satisfactorily completed, another grower stepped up, and the same plan was followed until all the selected sprayers had performed. The growers then returned their estimate cards; these were compiled, and the grower coming nearest the total number of gallons used by the different sprayers was declared the winner and received a suitable prize.

--- New York Entomology Annual Report,  
1937.

### TWILIGHT MEETINGS

During the season some of the county agents arranged so-called twilight meetings for the purpose of presenting important last-minute developments to the farmers on the eve of making a spray application. Whenever one of these meetings coincided with a visit of the specialist to the county, the specialist was called upon to speak to the growers on current insect-control information.

--- New York Entomology Annual Report,  
1937.

### SEASONAL CONFERENCES

Once during the growing season a conference of county agents, research investigators, and extension specialists was held at Geneva to compare experiences and to lay plans for the spray program for the remainder of the season. This proved to be an important midseason conference.

--- New York Entomology Annual Report, 1937.



## GARDEN INSECTS

Garden insects were again listed as one of the major lines of work in 1937. Since gardening is one of the main lines of work carried on by the extension horticulturists, work was carried on throughout the entire State. Each county has one or more demonstrators enrolled in gardening.

At the beginning of the season, it was suggested that each county carrying on demonstrations in gardening devote at least part of one demonstration period during the spring months to garden insect control. Where this was done, we had much less injury from insects. Different types of insects were discussed and methods of controlling both the biting and sucking insects were demonstrated. Some of the home demonstration agents are very good in this line of work, and it is not necessary for the extension entomologists to visit them. The insects with which we are having the most trouble are the squash bug and the spotted and striped cucumber beetles. A few samples of gypsum and calcium arsenate and also 1-percent rotenone were distributed among the home demonstration agents early in the season.

So far it has been impossible to get the dealers in insecticides to carry gypsum in stock, and for that reason very little is used in the State. In all probability, very little rotenone will be used for the control of the cabbage worm until the price is reduced. Many of the gardeners prefer to use arsenate of lead or paris green.

--- Oklahoma Entomology Annual Report,  
1937.

## BOYS' AND GIRLS' CLUB WORK

A new type of activity with the 4-H Clubs was initiated in 1937. For the first time, a project in beekeeping was offered, the outline for which was adapted from one used in New York. Work on insect collections and the control of garden insects was not emphasized as in former years.

In February, the county club agents were notified that supervision would be given the work of club members who elected the beekeeping project. During the next few weeks, the project was promoted by showing a honeybee film, by sending letters to those interested in the subject, and by means of personal visits. Orders for supplies were combined in order to take advantage of the discount allowed to such clubs. When the supplies arrived, they were distributed to the various members, and each member was given the necessary assistance in assembling the different units. Two-pound packages of bees were obtained, the main shipment arriving about the middle of April. These were distributed and installed. Information on beekeeping methods was provided and assistance was given as needed. Each member was supplied with a comprehensive bulletin on beekeeping. A close check on progress was made through frequent visits.

--- Delaware Entomology Annual Report,  
1937.

## SUMMARY OF RESULTS IN INSECT CONTROL

The insect-control work in 1937 was conducted by extension entomologists in 99 counties. A total of 15 counties included insect control in their county plan of work. The extension entomologist and his assistants spent a total of 416 days in the field, conducting demonstrations, meetings, surveys, and planning campaigns with county agents.

The entomologist and county agents conducted a total of 472 meetings on insect control with an attendance of 17,962 persons. The entomologist held 296 meetings with an attendance of 12,360 persons.

A total of 50,000 bulletins and circulars were handed out or sent to persons requesting information about insect control.

Radio talks were given and a total of 1,260 first-class letters were written in reply to insect-control problems.

County-wide insect-control campaigns were conducted in 50 counties. In 99 counties, 15,170,000 pounds of poison bran were used to control armyworms, grasshoppers and cutworms, a total of 5,000 gallons of creosote was used to control chinch bugs. A total of 45,000 persons used this material (poison bran and creosote) to control insects. The value of crops saved from chinch bugs, army worms, grasshoppers and cutworms alone would be \$7,000,000.

The educational advances which cannot be measured in terms of dollars and cents are by far the most valuable results of the work. When we realize that over 50,000 persons in Iowa have been taught how to control at least one major insect pest and have been sold on the value of this farm practice, we then have an idea of the significance of this phase of extension work. We further realize the need of this work when we know the annual damage of insects and rodents in Iowa amounts to approximately \$50,000,000.

-- Iowa Entomology Annual Report, 1937.

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EXCERPTS FROM COUNTY AND HOME DEMONSTRATION AGENT REPORT

ENTOMOLOGY

Month and Year	Work planned	Work accomplished
1936: November	Entomology exhibit at achievement day.	Several boxes of mounted insects, moths, and butterflies were exhibited at women's achievement day.
1937: February	One entomology leader from each unit attends lesson on Garden Insects.	Several entomology leaders from farm-bureau units attended training school on Garden Insects.
March	No work planned	Several leaders gave lesson material on Garden Insects at unit meetings.
July	No work planned	Garland, Tubtown, Northwest Scott, Mapleton, Drywood, and Northeast Scott farm-bureau units made fly spray. E. G. Kelly, entomologist, attended 4-H camp at Riverton, Kans., and gave instruction on mounting and collecting insects.
August	No work planned	Two 4-H Club boys, Richard Boyce and Sam Cole, presented a demonstration on Insect Control at Bourbon County Fair.
September	No work planned	Demonstration on Insect Control presented at State Fair at Hutchinson.

Summary

12 leaders secured.  
 8 meetings held.  
 438 attendance.  
 19 office calls.  
 1 circular letter.  
 1.4 days devoted to project.  
 1 day of specialist help.  
 100 gallons of fly spray made.

The entomology project was carried as a project in this county in women's work. Two lessons were given - one on biology, morphology, insect collecting and methods of control, and another on collecting of insects, methods of pinning and mounting insects for preservation and mounting. These lessons were enjoyed by the women. This project aroused interest in collecting and mounting insects. The lesson on garden insects given this year very logically worked in with the program last year. Mimeographed copies of the formulas given at this meeting were made and handed out by the leaders at their unit meeting.

An entomology exhibit consisting of mounted insects, moths, and butterflies was shown on Women's Achievement Day, October 27.

Two boys from Northeast Scott 4-H Club (Richard Boyce and Sam Cole), gave a demonstration on Insect Control at the Bourbon County Fair. In this demonstration they mixed insecticides for both biting and sucking insects. This demonstration was later given at the State Fair at Hutchinson.

E. G. Kelly, entomologist, attended 4-H camp at Riverton and gave instruction on collecting and mounting insects. All the 4-H Club members enjoyed this instruction. Several members have continued this collecting at home. Some of these 4-H boys and girls have had their parents buy cyanide for them. Others have fixed nets. This work of Mr. Kelly replaced handicraft work this year at camp. The agents believe that much of the success of the camp was dependent on Mr. Kelly and his work with the 4-H boys and girls.

—Kansas Home Demonstration Agent  
Annual Report, Bourbon County, 1937.

#### FARM BUREAU WOMEN MAKE FLY SPRAY

One hundred gallons of fly spray have been made by the women of six farm bureau units at a cost of approximately 35 cents a gallon. Following the lesson given by Mr. Kelly on Garden Insects, the leaders became interested in making fly spray. Pyrethrum extract was purchased and mixed with kerosene. The cost was prorated among the members of the unit desiring the fly spray. In this manner the following farm-bureau units made fly spray: Northwest Scott, Mapleton, Drywood, Northeast Scott, Garland, and Tubtown.

All the women have been well satisfied with the fly spray, and have felt that there was little difference between this fly spray and that purchased at the stores at \$1 to \$1.20 a gallon.

—Kansas Home Demonstration Agent  
Annual Report, Bourbon County, 1937.



## HOME HEALTH AND SANITATION

Twenty-five requests have come for help with control measures on cockroaches, moths, and ants. Ants especially are a household pest in the sandy locations. The president of the County Federation of Women's Clubs apologized to the home agent for the powder she had sprinkled on the floor of the house. She said they never could keep ants out of the house in the summer. The sheet of directions for some ant-control mixtures were sent to her. This fall she told the home agent that they immediately followed instructions, and in a short time ants were gone from the house and even from the lawn, and that the formula had been given to nearly everyone on their road for their use.

--Ohio Home Demonstration Agent Annual Report, Lake County, 1937.

## A CAMPAIGN MEETING TO BE USED BY AGENTS

Demonstration - Home-made flypaper - 12 sheets for 1 cent.

Exhibit - Two home-made fly traps.

Early prevention in March - Flowers of Pyrethrum or hellebore added to sifted manure piles to kill maggots.

Specialist discussion - Disposal of waste, flyproof toilets, screens, and other subjects for discussion.

County extension agents are to carry on county-wide campaigns.

--Parent Education and Child Development Annual Report, Colorado, 1937.

## CUT-ANT CONTROL

Seventy gallons of carbon disulphide was purchased in bulk to kill cut ants by 35 farmers living in 3 communities. A saving of \$42 was effected by purchasing the "high life" in bulk.

A survey of the damage caused by cut ants in the Salem community showed that a total of 71 crops were destroyed on the 21 farms of this community during the crop year of 1936. Farmers of this community signed agreements to treat all colonies within their fields and within 400 yards on the outside of their fields during the month of February.

The extension entomologist and the county agent gave two demonstrations in killing cut ants in this community, and the farmers carried out their agreements. So effective was their work that no damage has been reported this year from cut ants in any form in this community. They estimate the value of crops saved at \$1000.

--Texas County Agent Annual Report, Newton County, 1937.

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### TIMELY TOPICS

#### CRYOLITE AND BARIUM FLUOSILICATE SUCCESSFULLY USED IN CONCENTRATED FORM

S. F. Potts, New Haven, reports that, although cryolite and barium fluosilicate are relatively cheap insecticides, they have been considered unsatisfactory for the control of forest and shade-tree pests because they will cause injury to tender foliage and because 0.25 inch of rain will remove from 95 to 98 percent of the deposit when these chemicals are applied in ordinary spray concentrations. However, the past season's work showed that when applied with special equipment, in the form of concentrated mixtures with adhesives, over half of the cryolite or barium fluosilicate remained after 6-weeks' weathering, during which period 5 inches of rain fell, and no plant injury resulted.

#### DERRIS, CUBE, AND CRYOLITE CONTROL MEXICAN BEAN BEETLE ON POLE BEANS

L. W. Brannon, of the Norfolk, Va., laboratory, reports that results of an experiment conducted in pole lima beans demonstrated that dusts or sprays containing derris, cube, or cryolite are effective against Epilachna varivestis Muls. on crops of lima beans grown commonly on poles and from which pickings are made throughout a long period of the growing season. Insecticide applications made to the pole beans on June 14, July 1, and July 14, were apparently reflected throughout the season in increased yields, as compared with comparable untreated plots, as at the end of the seventh picking (approximately September 30), pronounced increases in yield were noted on the treated plots. The effect of the insecticide treatments on the first and second pickings of the crop earlier in the season were also strikingly apparent, as judged from the yield records made at that time. It appears that sprays or dust mixtures containing derris, cube, or cryolite, when applied properly, are effective in controlling the Mexican bean beetle, not only on beans of the bush type but also of the pole type.

#### EFFECT OF FLOODING ON CAMMULA PELLUCIDA

E. G. Davis, Bozeman, states that egg beds of Cammula pellucida Scudd. on the study area maintained in the Centennial Valley, southwestern Montana, were flooded with irrigation water from April 23 until August 15, when water was diverted to permit haying operations. During this period the wild hay meadows, with the exception of a few higher knolls, were almost continuously under water, and the soil was at all times supersaturated. Hatching on the dry knolls began on June 15, the normal hatching date for this area. Hatching in ground which had been flooded began on August 20, 5 days after irrigation water was removed, and continued until September 15 in the lower sections of the meadows. Although the eggs were under water for over 3 months during the spring and summer, all eggs examined appeared viable and hatched in normal numbers. Although the current year's hatch was not prevented by flooding, it was delayed long enough to prevent grasshoppers from maturing in time to deposit eggs, and will result in greatly decreased populations in the hay meadows in 1939.



## SUBSTITUTES FOR BRAN AND SAWDUST IN GRASSHOPPER BAITS

J. R. Parker, of the Bozeman, Mont., laboratory, says that during the spring and summer of 1938, members of the staff of the Bozeman laboratory conducted experiments in Kay County, Okla., to test bait materials available in Southern States which might be substituted for either bran or sawdust, the most commonly used carriers for grasshopper poison in the North. The following combinations gave results which statistically were not significantly different from a bait consisting of three parts bran and one part sawdust by volume:

- (1) Citrus meal one part to sawdust three parts;
- (2) Citrus meal one part to cottonseed hulls three parts;
- (3) Mill-run bran one part to cottonseed hulls three parts.

The carrier in each bait was equal in volume to 100 pounds of dry bran. Liquid sodium arsenite, 2 quarts, was used as the killing agent.

## GRASSHOPPER MIGRATION

"An interesting experiment was conducted in North Dakota last summer to determine how far and how fast grasshoppers fly in the course of a migratory movement," says an editorial in the Montana Farmer (December 1). "Approximately 100,000 'hoppers were sprayed with a fast-drying red lacquer and released on July 17 a few miles west of La Moure. . . Two days following the release, some of the marked specimens were found at a point 20 miles northwest of the starting place. In 14 days specimens were found 215 miles from La Moure. The direction of the dispersal ranged from north to northwest of the point of release. Although winds blow from the south and southeast, as well as from the north and northwest during the period covered by the observation, it was found that the heaviest flights were generally with the winds from the south despite the fact that the average velocity of the winds from the north was somewhat higher. Similar tests were made in other parts of the 'hopper territory last summer. . ."

## COLLECTION OF INSECTS ON FLIGHT SCREENS

During the 5 years from 1933 to 1937, inclusive, 12 flight screens, each consisting of 2 stationary frames set at right angles and covered with 4,320 square inches of tanglefooted wire screen were operated by K. P. Ewing and associates at Port Lavaca, Tex., for determining the flight of cotton flea hoppers and boll weevils. In 1938 these screens were discontinued, and four revolving screens with one side that always face the wind were substituted. Records during previous years had shown that, especially during the migratory period, approximately as many flea hoppers were caught on the revolving screens with only half the tanglefooted area as on the stationary screens. The numbers of flea hoppers and boll weevils caught per screen -

a rough index of the numbers present - were as follows:

Year	Flea hoppers		Boll weevils	
	August	Seasonal total	August	Seasonal total
1933	117.4	1,159	24.3	24.9
1934	60.2	971	10.9	11.4
1935	38.8	482	3.7	5.3
1936	60.0	242	1.7	4.3
1937	41.9	605	47.1	75.0
1938	38.2	355	2.8	3.0

During the principal period of migration (March to June) more than twice as many flea hoppers were caught on the windward side of the revolving screens as on the leeward, whereas during July and August slightly more flea hoppers were taken on the leeward than on the windward side.

#### DUSTING SULPHUR AND SULPHUR-PYRETHRUM DUST MIXTURE GIVE BEST RESULTS AGAINST POTATO LEAFHOPPER ON BEANS

In summarizing the results obtained in insecticide tests against Empoasca fabae (Harr.) on beans in Ohio in 1938, N. F. Howard, of the Columbus, Ohio, laboratory, reports that the application of dusting sulphur or a sulphur-pyrethrum dust mixture gave the best results and were superior to sprays containing some of the newer developed copper sulphates, basic copper arsenates, or sulphur nitride. Derris sprays also were comparatively ineffective. When used with peanut oil or pine oil, the effectiveness of the dorriss sprays was increased, but peanut oil caused a yellowing of the bean leaves and subsequent defoliation and, although pine oil caused less injury to the bean foliage, it appeared to be too injurious to be recommended for general use.

#### PARIS GREEN-SULPHUR DUST MIXTURE CONTROLS FLEA BEETLES ON SUGAR BEETS

H. E. Dorst, of the Logan, Utah, laboratory, reports that recent experiments in the control of flea beetles attacking sugar beets in Utah indicated that a paris green-sulphur dust mixture (7.5 - 92.5) was effective against these pests. A 94-percent control was observed 72 hours after application and a 61-percent control was recorded after 3 days, during which control period intermittent precipitation occurred. Experiments in the control of the flea beetles with sprays indicated that a spray composed of 1 pound of sulphur and 7 pounds of Paris green per 100 gallons of water gave a 71-percent control after the expiration of 48 hours. The flea beetle population consisted principally of the hop flea beetle (Psylliodes punctulata Melsh.).



## MORE ON ETHYLENE DICHLORIDE FOR PEACH BORER CONTROL

In cooperation with the State natural history survey of Illinois, experiments with ethylene dichloride emulsion applied in the early spring for the control of the peach borer have just been completed in southern Illinois. Oliver I. Snapp, in charge of this work, has submitted the following summary of the results obtained from this material, as compared with paradichlorobenzene crystals. There was no preparation whatever of the soil around the trees before the ethylene dichloride emulsion was applied for these early spring experiments, and the application of that material was made by merely pouring the dose on the soil around the base of the tree and on the lower part of the trunk, from a half-pint tin cup, and covering the treated surface with a little soil. The results of these experiments show that ethylene dichloride emulsion is about as effective against the peach borer when applied early in the spring as at any other season of the year, and it gave excellent control of the insect at a time when paradichlorobenzene crystals gave practically no control, because of low soil temperatures. Ethylene dichloride emulsion is safer than paradichlorobenzene for use on peach trees, especially on young trees, and is somewhat cheaper and easier to apply, and in addition it is effective at times when paradichlorobenzene crystals give poor results.

## PROCESS OF MAKING DINITRO-O-CRESOL SAFE FOR FOLIAGE

The high insecticidal value of dinitro-o-cresol has been known for some time but, because it is very injurious to the foliage of plants, its use is limited to dormant sprays. In an attempt to retain the insecticidal properties of this compound and at the same time to diminish its toxicity to plants, L. E. Smith, of the Division of Insecticide Investigations has made certain derivatives of this compound. The ether of dinitro-o-cresol was patented by Mr. Smith on April 26, 1938 (U. S. Patent 2,115,046). On August 16, 1938, Mr. Smith was granted U. S. Patent 2,127,090, which covers the use as insecticides of esters of dinitro-o-cresol. It is hoped that these derivatives will be less injurious to foliage than was the parent compound.

## INSECT WARFARE

"In a publication called 'Men and Methods in Research,' by the Ohio State University Research Foundation, is a dramatic story of the continuous battle being waged by science against destructive insects," says T. A. McNeal in Kansas Farmer (November 5). "It is really the greatest scientific battle of the ages. Of course, the battle is not being waged entirely, not even principally, in the laboratories of the scientists. Such practical weapons as traps, swatters, fire, plowing, flooding, electricity, sprays and dusts that destroy the insect pests by contact with them or kill them by reason of being swallowed, are being used . . . It is not certain even yet that man, through the help of scientists, will win. It is certain, however, that if the battle against the insects had not been waged, by this time both horticulture and agriculture would be in an exceedingly bad way. I doubt whether there would be a single successful orchard either of the

citrus fruits or a peach or apple or pear orchard still surviving in the United States. Even grain crops, while not in quite as bad condition as the orchards, would have been badly damaged. The world by this time would be on the verge of starvation, and triumph of the insects would be nearly if not entirely complete."



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